

Completion Report of Contaminant Analyses for the  
Level II Study at  
Overflow National Wildlife Refuge

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(Follow up to  
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## INTRODUCTION

A detailed contaminant investigation (level II report) was completed by Smith (1990) for Overflow National Wildlife Refuge (NWR) to: 1) identify changes in organic and inorganic contaminant levels in fish tissue and sediments from 1986 to 1989, 2) determine possible sources of contamination, and 3) determine if sources of contamination originated from the 7,400 acres of proposed acquisition land (Figure 1). The level II report recommended the following: 1) the proposed land acquisition be completed, 2) the advisory for the consumption of fish captured from the NWR and proposed acquisition land be continued, and 3) additional residue analyses of fish be continued at least every two years to monitor levels of mercury, selenium, DDT and metabolites (DDTM), and toxaphene.

The study design and methods for collection and analyses of the fish and sediments are described by Smith (1990). Sediment and fish tissue samples for the level II study were collected in December 1989 from various sites on and near the NWR and proposed acquisition land (Figure 2). Due to time limitations pertaining to the purchase of the proposed acquisition area, only select tissue and sediment samples were analyzed in February 1990 for mercury, selenium, and organochlorines (OC). The results of these analyses were presented in the level II report (Smith 1990).

The samples analyzed in February contained high concentrations of mercury and selenium; however, high concentrations of organochlorines were not apparent. Therefore, the remaining samples were later analyzed for selenium and mercury only. This completion report presents only the results of residue analyses for the remaining fish tissue and sediment samples that were not included in the level II report.

## RESULTS

### Fish Tissue Samples

Only the piscivorous/omnivorous fish (Table 1) from the off refuge site (OV-20) had an average mercury concentration that exceeded the EPA recommended level of 1.0 ppm for fillets (EPA 1989). Concentrations of mercury in whole body samples would range from half to equal the concentrations found in fillets (Wiener 1988). Therefore, the average level of mercury in fillets at OV-20 may be higher than the 1.4 ppm found in this whole body sample. The other fish tissue samples, which were collected from sites within the refuge, contained lower concentrations of mercury. Average concentrations of selenium in the fish tissue samples (Table 1) were all less than the EPA recommended level of 5.4 ppm for fish fillets (EPA 1989).

### Sediment Samples

Mercury concentrations in sediment samples ranged from .02 to .06 ppm (Table 2). As mentioned in the level II report, background levels for mercury in soils from the United States ranged from .02 to .11 ppm in uncontaminated areas of the north central U.S. up to 4.1 ppm in contaminated sites. However, with a bioconcentration factor of 5,000 for mercury, concentrations in sediments in or near the NWR may bioaccumulate to levels of concern in biota. None of the sediment samples from on or near the NWR had selenium concentrations that approached the 1.0 ppm level which the Wisconsin Department of Natural Resources (DNR) considers safe for open water dumping (Wisconsin DNR 1985).

### SUMMARY AND CONCLUSIONS

It was apparent that the samples analyzed earlier contained the highest concentrations of contaminants when the results of the residue analyses from the level II report (Smith 1990) were compared to the results of the current analysis. The level II report concluded that: 1) there is no apparent contamination to existing refuge lands from the proposed acquisition land, 2) much of the currently operational agricultural land with its application of herbicides and insecticides will be taken out of production, 3) except for toxaphene, contaminant concentrations have either remained the same or decreased, and 4) the major source of any contamination near the refuge appears to be from above the acquisition land or from an adjacent watershed. The samples analyzed for this report support the earlier conclusions. Therefore, our recommendations are identical to those expressed in the level II report.

### Literature Cited

- Environmental Protection Agency. 1989. Toxic Criteria Summary Table. Region IV, Water Quality Standards Unit, Water Management Division. U.S. Environ. Protec. Agency.
- Smith, S.B. 1990. Level II contaminant investigation of Overflow National Wildlife Refuge, Wilmot, Arkansas. Fish and Wildlife Enhancement, Vicksburg, MS. Mimeo. 8pp.
- Wiener, J.G. 1988. Lake acidification increases mercury accumulation by fish. U.S. Fish and Wildlife Service Research Information Bulletin No. 88-63. National Fisheries Contaminant Research Center, Field Research Station, LaCrosse, WI.
- Wisconsin Department of Natural Resources. 1985. Report of the technical subcommittee on determination of dredge material suitability for in-water disposal. Unpublished Report.



FIGURE 1: Overflow National Wildlife Refuge -- current boundaries and proposed land for acquisition.

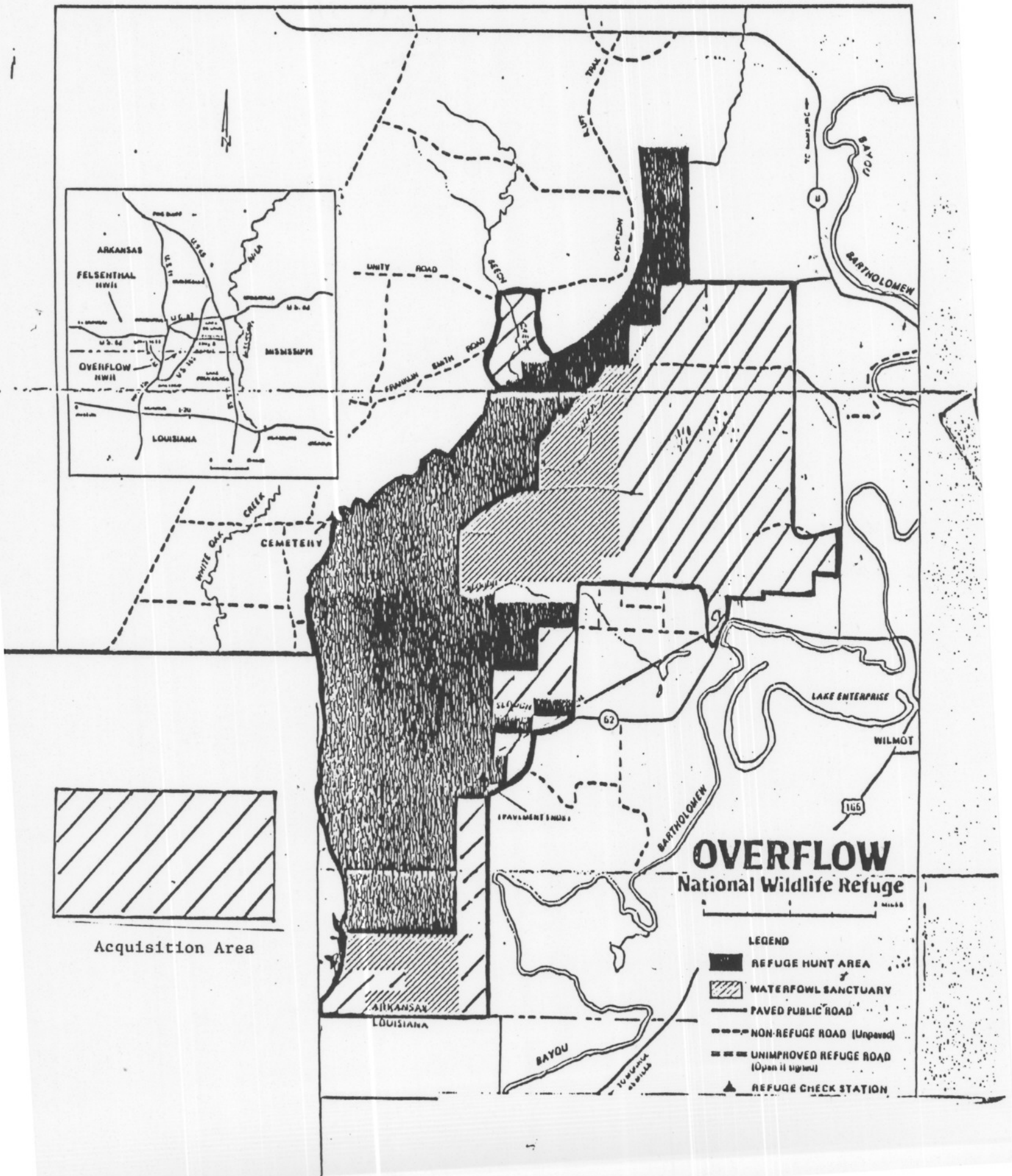
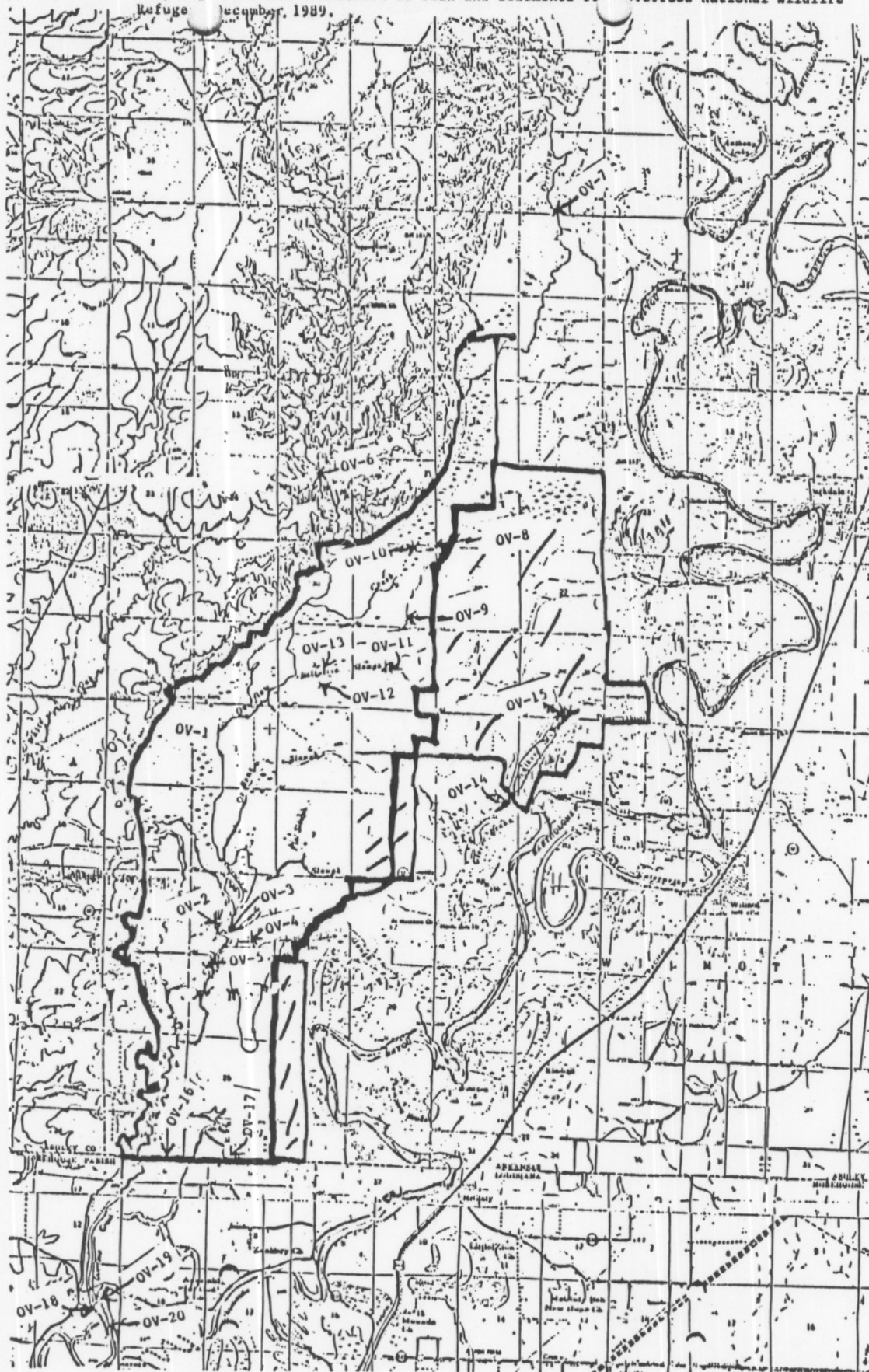


FIGURE 2. Sampling sites for collection of fish and sediments from Overflow National Wildlife Refuge, December, 1989.



**TABLE 1.** Mean Mercury (Hg) and Selenium (Se) Concentrations (ug/dry weight--ppm) in Fish Tissue Samples Collected on or near Overflow NWR in December 1989.

| Site  | Feeding Group                                  | Hg  | Se   |
|-------|--|-----|------|
| OV-3  | Bottom <sup>1</sup>                            | .26 | 1.55 |
| OV-11 | Piscivore <sup>2</sup>                         | .72 | 1.30 |
| OV-20 | Piscivore <sup>3</sup> / Omnivore <sup>4</sup> | 1.4 | 1.06 |

1 - Smallmouth Buffalo (*Ictiobus bubalus*) and Common Carp (*Cyprinus carpio*)

2 - Largemouth Bass (*Micropterus salmoides*) and White Crappie (*Pomoxis annularis*)

3 - White and Black Crappie (*Pomoxis annularis* and *nigromaculatus*)

4 - Freshwater Drum (*Aplodinotus grunniens*)



**TABLE 2.** Mercury (Hg) and Selenium (Se) Concentrations (ug/dry weight--ppm) in Sediment Samples Collected on or near Overflow NWR in December 1989.

| Site    | Hg  | Se  |
|---------|-----|-----|
| OV - 2  | .03 | .58 |
| OV - 5  | .06 | .71 |
| OV - 12 | .05 | .58 |
| OV - 14 | .02 | .38 |
| OV - 16 | .03 | .77 |
| OV - 19 | .03 | .33 |